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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/822,774

04/13/2004

Stephen R. Forrest

12992/91301

3185

23838

7590

11/04/2005

KENYON & KENYON

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WASHINGTON, DC 20005

EXAMINER

DICKEY, THOMAS L

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 11/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/822,774

Applicant(s)

FORREST ET AL.

Examiner

Thomas L. Dickey

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 7/13/04; 10/19/04; 4/4/05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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DETAILED ACTION

1. The amendment filed on 09/23/2005 has been entered.

Election/Restriction

2. Applicant's election with traverse of the embodiment illustrated in Figure 1, including claims 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 21, 22, 23, 30, and 31 in the reply filed on 09/23/2005 is acknowledged. The traversal is on the ground(s) that in general, embodiments of the invention are all directed to a mixed donor-acceptor layer in combination with a pure acceptor layer and/or a pure donor layer, where the pure layer comprises one of the materials for the mixed layer: This is found persuasive.

The requirement is deemed not proper in light of Applicant's arguments is therefore WITHDRAWN.

Oath/Declaration

3. The oath/declaration filed on 04/13/2004 is acceptable.

Drawings

4. The formal drawings filed on 04/13/2004 are acceptable.

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Priority

5. Applicants have made no claim for priority.

Information Disclosure Statement

6. The Information Disclosure Statements filed on 7/13/04, 10/19/04, and 4/4/05 have been considered.

Double Patenting

7. A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.

Claims 1-31 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 1-31 of copending Application No. 10/910371. This is a

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provisional double patenting rejection since the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-28, 30, and 31 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for, for example organic acceptor/donor materials such as CuPc, ZnPc, C₆₀, Alq3 PTC-BI and DA, PPEI, PPV, or POEPT does not reasonably provide enablement for any and all organic acceptor/donor materials, the range of which is suggested by claims 11 and 12 to include at the very minimum: fullerenes; perylenes; catacondensed conjugated molecular systems such as linear polyacenes (including anthracene, naphthalene, tetracene, and pentacene), pyrene, coronene, and functionalized variants thereof, alone, and in a large range (donor and acceptor material mixed in a ration ranging from at least 1:10 to 10:1) of mixtures. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims. Making the invention requires a pre-knowledge of the characteristic transport length of mixture of chemicals that make up the first organic layer, as well as of the optical absorption length of the material forming the second organic layer. For the

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vast majority of mixtures of organic acceptor/donors the characteristic transport length, although assumed to be not less than about 10 nm nor more than about 100 nm, is in fact unknown. For example, what do applicants (or anyone) know about the characteristic transport length of a combination of C₁₁₈ fullerenes and titanyl phthalocyanine, combined in a ratio of 1:3.5?

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

A. Claim 29 is rejected under 35 U.S.C. 102(a) as being anticipated by Maennig et al., "Organic p-i-n solar cells" (as cited by applicant 10-19/04).

Sample F shown in figure 7 of Maennig et al. discloses a solar cell comprising an ITO first electrode; an Au second electrode; and an organic photoactive region ("30 nm ZnPc:C₆₀") disposed between the first and second electrodes, wherein the photoactive region is comprised of a mixture of two (ZnPc and C₆₀) organic materials, and wherein a change of 15 mA/cm² yields a change of about .01 Volts, so that the series resistance

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between the first and second electrodes is in the range of about $0.25 \Omega\text{-cm}^2 \pm 0.15 \Omega\text{-cm}^2$.

B. Claims 1-12, 17, 19-28, 30, and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by BURROUGHES (2003/0039803).

With regard to claim 20 Burroughes discloses a device comprising a first electrode 32; a second electrode 42; a photoactive region disposed between the first electrode 32 and the second electrode 42, the photoactive region comprising a first organic layer 36-38 comprising a mixture of an organic acceptor material MEH-PPV and an organic donor material CN-PPV in an average ratio of about 1:1 (which is in the range from about 10:1 to about 1:10) wherein the first organic layer 36-38 has a thickness of as little as 1 nm (5 angstroms for MEH-PPV/CN-PPV sublayer 38 and another CN-PPV/MEH-PPV sublayer 36), which is less than 0.3 characteristic transport lengths (note that Lazarev et al. have measured the characteristic transport length for excitons in PPV to be about 9 nm. See US 20040067324 A1); and a second organic layer 38 in direct contact with the first organic layer 36-38, wherein: the second organic layer 38 comprises an unmixed layer of the organic donor material CN-PPV of the first organic layer 36-38, and the second organic layer 38 has a thickness of up to 3000 angstroms, well in excess of about 0.1 optical absorption lengths. Note figure 3 and paragraphs 32-37 of Burroughes.

With regard to claims 1-12, 17, 19, 22, and 23 Burroughes discloses a solar cell or photodetector comprising an ITO first electrode 32; a second electrode 42; a

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photoactive region disposed between the first electrode 32 and the second electrode 42, the photoactive region comprising a first organic layer 36-38 comprising a mixture of an organic acceptor material MEH-PPV and an organic donor material CN-PPV in an average ratio of about 1:1 (which is in the range from about 10:1 to about 1:10) wherein the first organic layer 36-38 has a thickness of as little as 1 nm (5 angstroms for MEH-PPV/CN-PPV sublayer 38 and another CN-PPV/MEH-PPV sublayer 36), which is less than 0.3 characteristic transport lengths (note that Lazarev et al. have measured the characteristic transport length for excitons in PPV to be about 9 nm. See US 20040067324 A1); and a second organic layer 34 in direct contact with the first organic layer 36-38, wherein: the second organic layer 34 comprises an unmixed layer of the organic acceptor material MEH-PPV of the first organic layer 36-38, and the second organic layer 34 has a thickness of up to 3000 angstroms, well in excess of about 0.2 optical absorption lengths. With particular regard to claims 11 and 12 Burroughes discloses that the organic acceptor and donor materials are PPV (poly phenylene-vinylene), which is a functionalized variant of the group consisting of: fullerenes; perylenes; catacondensed conjugated molecular systems such as linear polyacenes (including anthracene, naphthalene, tetracene, and pentacene). Note figure 3 and paragraphs 32-37 of Burroughes.

The applicant's claims 3,4, and 7-10 do not distinguish over the Burroughes reference regardless of the functions allegedly performed by the claimed device, because only the device per se is relevant, not the recited functions of operating with a

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power efficiency of 2% (5%) or greater, or operating with each of the first and second organic layers contributes at least about 5 (10) percent of the total energy output of the photoactive device, and each of the first and second organic layers absorbs at least about 5 (10) percent of the energy absorbed by the photoactive region.

Note that functional language in a device claim is directed to the device per se, no matter which of the device's functions is referred to in the claim. See *In re Ludtke and Sloan*, 169 USPQ 563 at 567, and *In re Swinehart* 169 USPQ 226, both of which make it clear that it is the patentability of the device per se which must be determined in a "functional language" claim and not the patentability of the function, and that an old or obvious device alleged to perform a new function is not patentable as a device, whether claimed in "functional language" claims or not. Note that applicant has the burden of proof in such cases, as the above caselaw makes clear. See also *In re Schreiber*, 44 USPQ2d 1429, 1432 (Fed. Cir. 1997), for a discussion of the roles of examiner and applicant in determining when and how functional limitations distinguish a claim from prior art disclosing the same structure.

With regard to claims 24-28 Burroughes discloses a device comprising a first electrode 32; a second electrode 42; a photoactive region disposed between the first electrode 32 and the second electrode 42, the photoactive region further comprising: a first organic layer 36-38 comprising a mixture of an organic acceptor material MEH-PPV and an organic donor material CN-PPV wherein the first organic layer 36-38 has a thickness of as little as 1 nm (5 angstroms for MEH-PPV/CN-PPV sublayer 38 and

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another CN-PPV/MEH-PPV sublayer 36), which is less than 0.3 characteristic transport lengths (note that the Russians have measured the characteristic transport length for excitons in PPV to be about 9 nm. See RU 2186821 C, or in English, US 20040067324 A1); a second organic layer 34 in direct contact with the first organic layer 36-38, wherein: the second organic layer 34 comprises an unmixed layer of the organic acceptor material MEH-PPV of the first organic layer 36-38, and the second organic layer 34 has a thickness of up to 3000 angstroms, well in excess of about 0.2 optical absorption lengths; and a third organic layer 40 disposed between the first electrode 32 and the second electrode 42, the third organic layer 40 being in direct contact with the first organic layer 36-38, wherein: the third organic layer 40 comprises an unmixed layer of the organic donor material CN-PPV of the first organic layer 36-38, and the third organic layer 40 has a thickness of up to 3000 angstroms, well in excess of about 0.1 optical absorption lengths. Note figure 3 and paragraphs 32-37 of Burroughes.

The applicant's claims 26 and 27 do not distinguish over the Burroughes reference regardless of the functions allegedly performed by the claimed device, because only the device per se is relevant, not the recited function of operating with a power efficiency of 2% (5%) or greater.

Note that functional language in a device claim is directed to the device per se, no matter which of the device's functions is referred to in the claim. See *In re Ludtke and Sloan*, 169 USPQ 563 at 567, and *In re Swinehart* 169 USPQ 226, both of which make it clear that it is the patentability of the device per se which must be determined in a

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“functional language” claim and not the patentability of the function, and that an old or obvious device alleged to perform a new function is not patentable as a device, whether claimed in “functional language” claims or not. Note that applicant has the burden of proof in such cases, as the above caselaw makes clear. See also *In re Schreiber*, 44 USPQ2d 1429, 1432 (Fed. Cir. 1997), for a discussion of the roles of examiner and applicant in determining when and how functional limitations distinguish a claim from prior art disclosing the same structure.

With regard to claims 30 and 31 Burroughes discloses a solar cell a first electrode 32; a second electrode 42; an first organic layer 36-38 disposed between the first 32 and second 42 electrodes, wherein the first organic layer 36-38 comprises a mixture of an organic acceptor material MEH-PPV and an organic donor material CN-PPV; and a second organic layer 34 disposed between the first electrode 32 and the second electrode 42, wherein the second organic layer 34 comprises an unmixed layer of the organic acceptor material MEH-PPV or the organic donor material CN-PPV of the first organic layer 36-38. Note figure 3 and paragraphs 32-37 of Burroughes.

The applicant's claims 30 and 31 do not distinguish over the Burroughes reference regardless of the functions allegedly performed by the claimed device, because only the device per se is relevant, not the recited function of operating in such a way that photons absorbed by the first organic layer contribute at least 5 or 10 percent of the photocurrent generated by the device, and photons absorbed by the second organic layer contribute at least 5 or 10 percent of the photocurrent generated by the device.

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Note that functional language in a device claim is directed to the device per se, no matter which of the device's functions is referred to in the claim. See *In re Ludtke and Sloan*, 169 USPQ 563 at 567, and *In re Swinehart* 169 USPQ 226, both of which make it clear that it is the patentability of the device per se which must be determined in a "functional language" claim and not the patentability of the function, and that an old or obvious device alleged to perform a new function is not patentable as a device, whether claimed in "functional language" claims or not. Note that applicant has the burden of proof in such cases, as the above caselaw makes clear. See also *In re Schreiber*, 44 USPQ2d 1429, 1432 (Fed. Cir. 1997), for a discussion of the roles of examiner and applicant in determining when and how functional limitations distinguish a claim from prior art disclosing the same structure.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 14-16 and 21 rejected under 35 U.S.C. 103(a) as being unpatentable over BURROUGHES (2003/0039803) in view of FORREST ET AL. (2003/0042846).

Burroughes discloses a device with all the limitations of claims 14-16 and 21 except a BCP non-photoactive exciton blocking layer disposed between the first electrode and

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the second organic layer, where the device is a the device is a tandem solar cell. Note figure 3 and paragraphs 32-37 of Burroughes.

However, Forrest et al. discloses a device with a first BCP non-photoactive exciton blocking layer (marked "BCP" in figure 1) disposed between a first electrode (marked "Ag" in figure 1) and a second organic layer (marked "PTCBI" in figure 1), where the device is a the device is a tandem solar cell (note the first and second cells PTCBI-CuPc shown in figure 1). Note figure 1 of Forrest et al. Therefore, it would have been obvious to a person having skill in the art to augment Burroughes's device with the BCP non-photoactive exciton blocking layer disposed between the first electrode and the second organic layer such as taught by Forrest et al. in order to prevent excitons from leaving the active area, and the tandem solar cell such as to absorb more light, to thus improve light conversion efficiency.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas L Dickey whose telephone number is 571-272-1913. The examiner can normally be reached on Monday-Thursday 8-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'T. L. Dickey', is positioned above the printed name.

Thomas L. Dickey
Patent Examiner
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10/05